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*Published in:*  
SPINE

*DOI:*  
[10.1097/BRS.0b013e3182388400](https://doi.org/10.1097/BRS.0b013e3182388400)

**IMPORTANT NOTE:** You are advised to consult the publisher's version (publisher's PDF) if you wish to cite from it. Please check the document version below.

*Document Version*  
Publisher's PDF, also known as Version of record

*Publication date:*  
2011

[Link to publication in University of Groningen/UMCG research database](#)

*Citation for published version (APA):*

Buitenhuis, J., & de Jong, P. J. (2011). Fear avoidance and illness beliefs in post-traumatic neck pain. *SPINE*, 36(25), S238-S243. <https://doi.org/10.1097/BRS.0b013e3182388400>

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## PSYCHOLOGICAL FEATURES

## Fear Avoidance and Illness Beliefs in Post-Traumatic Neck Pain

Jan Buitenhuis, MD, PhD,\* and Peter J. de Jong, PhD†

**Study Design.** A descriptive overview of the relevant literature and the introduction of a new psychological model.

**Objective.** The fear-avoidance (FA) model and the potential importance of illness beliefs in post-traumatic neck pain are discussed. The causal beliefs-anxiety model is introduced as an adaptation of the FA model, emphasizing the critical role of illness beliefs.

**Summary of Background Data.** Although the FA model is most thoroughly used to investigate chronic low back pain, it seems also highly relevant as a starting point for other chronic pain conditions like whiplash. Kinesophobia and pain catastrophizing form critical components of the FA model. It has been shown that breaking the FA cycle by affecting the critical components of the model may be an effective method to prevent the development of chronicity.

**Methods.** By using the FA model as a starting point, we present the causal beliefs-anxiety model and argue how this might help explain chronic whiplash symptoms and might provide clues for preventive interventions.

**Results.** On experiencing muscular neck pain, catastrophizing may give rise to dysfunctional illness beliefs regarding the cause of this pain. The illness identity and other beliefs feed symptom expectation and attribution, as well as expectations regarding the course of muscular neck pain. These negative expectations can contribute to a less favorable outcome or may even cause symptoms. Therefore, it seems important to integrate the alleged role of illness beliefs in an adapted FA model, the “causal beliefs-anxiety model.”

**Conclusion.** In clinical practice, it seems important to have insight into the patient's illness beliefs about the cause of the experienced symptoms. Health care professionals should be aware of the possible detrimental influence of dysfunctional illness beliefs. In the early stage, adequate explanation and information about the probable course may be sufficient to prevent the generation of dysfunctional

illness beliefs thereby preventing the development of a chronic course. At the population level, educational campaigns that inform people about probable causes and realistic expectations regarding post-traumatic neck pain could provide an effective strategy for preventing chronic whiplash symptoms.

**Key words:** whiplash, post-traumatic neck pain, fear-avoidance, catastrophizing, kinesophobia, illness beliefs. **Spine 2011;36:S238–S243**

Various factors are assumed to play a role in the etiology and maintenance of chronic post-traumatic neck pain.<sup>1</sup> Psychological factors can help to explain the limited association between somatic pathology and experienced symptoms. One of the most prominent psychological models of chronic pain is the fear-avoidance (FA) model (Figure 1). The FA model provides important theory-derived leads that may help explaining the pathway from acute to chronic pain.<sup>2,3</sup> Although this model is most thoroughly used to investigate chronic low back pain, it seems also highly relevant as a starting point for other chronic pain conditions. Accordingly, in this article, we present an adaptation of the FA model applied to post-traumatic neck pain. In this model, illness beliefs are regarded to be of paramount importance. When neck pain is attributed to or labeled as “whiplash,” patients are influenced by the image and connotations of this label within a particular cultural context. Within this cultural context patients develop beliefs regarding the experienced symptoms and expectations regarding the course of these symptoms. Accordingly, these beliefs may function as the gatekeeper, guarding the entrance to the chronic pain circle.

## THE FEAR-AVOIDANCE MODEL

When an acute pain condition is not perceived as threatening, patients usually continue daily activities thereby promoting functional recovery. However, catastrophic appraisals of experienced pain may lead to the dysfunctional belief that physical activity will exacerbate pain or lead to injury. This in turn may promote avoidance behavior and hypervigilance, which in turn may give rise to disability and depressive symptoms, resulting in disuse and continuing pain, thus ending-up in a self-perpetuating cycle—a downward spiral of increasing avoidance, disability, and pain (Figure 1).

The FA model has been applied to various chronic pain conditions (e.g., low-back pain, shoulder pain, sexual pain). Recently, it has been argued that this model might also be applied to whiplash.<sup>2–6</sup>

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Acknowledgment date: June 14, 2011. First revision date: August 8, 2011. Second revision date: August 29, 2011. Acceptance date: September 19, 2011.

The manuscript submitted does not contain information about medical device(s)/drug(s).

No funds were received in support of this work. No benefits in any form have been or will be received from a commercial party related directly or indirectly to the subject of this manuscript.

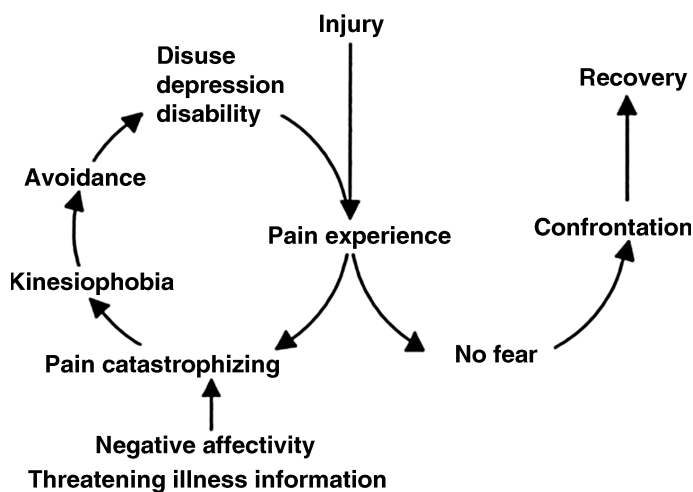
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DOI: 10.1097/BRS.0b013e3182388400

S238 www.spinejournal.com

December 2011

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**Figure 1.** The fear-avoidance model, based on Vlaeyen & Linton.<sup>2</sup> This figure has been reproduced with permission of the International Association for the Study of Pain® (IASP®). The figure may not be reproduced for any other purpose without permission.

## CATASTROPHIZING

In line with the FA model, these studies provided convincing evidence supporting the view that pain catastrophizing and attributional bias can play an important role in the development of chronic symptoms.<sup>7</sup> More specifically, it was found that the habitual tendency to make catastrophic interpretations of pain is associated with a heightened pain experience in various patient groups.<sup>8</sup> In addition, results indicated that pain catastrophizing is associated with heightened disability. This relationship was found to be independent of the level of actual physical impairment, which further underlines the importance of catastrophical ideation.<sup>9–11</sup>

Important for the present context, it has been shown that pain catastrophizing is similarly related to concurrent neck disability.<sup>9,10</sup> Thus, also for acute neck pain catastrophizing may lead to increased physical symptoms, which in turn may contribute to a delayed recovery. Accordingly, pain catastrophizing has consistently been associated with disability in patients experiencing neck pain.<sup>12,13</sup> However, the results regarding the potential impact of catastrophizing on the course of symptoms are mixed. Although there is some preliminary evidence that both catastrophizing and fear of movement have prognostic value for future disability and depression, a more recent study failed to replicate this finding.<sup>14</sup> The results of this subsequent study rather suggest that pain catastrophizing is predominantly involved in concurrent neck disability whereas it seems unrelated to future recovery.<sup>15</sup>

## KINESOPHOBIA

The FA model proposes that catastrophizing elicits pain-related fears, which in turn are assumed to motivate avoidance behavior. Physical activities, which are expected to cause or enhance pain, are avoided leading to disability and disuse. Furthermore, avoidance could lead to mood disturbances, like irritability and depression. These outcomes may further contribute to a dysfunctional course because both depression and disuse have been shown to be associated with enhanced pain perception.<sup>16</sup>

Various studies have demonstrated that chronic low back pain patients avoid behavioral performance tasks.<sup>2</sup> FA beliefs have been identified as one of the critical factors involved in this behavioral avoidance. In line with this, it was found that strong FA beliefs set people at risk for developing chronic low back pain. Patients with chronic low back pain who retrospectively reported a sudden traumatic pain onset more often develop kinesiophobic beliefs than patients who reported that the pain had started gradually.<sup>17</sup> In the case of whiplash, the onset of pain is often described as sudden, possibly setting the stage for the development of kinesiophobia.

Because of the apparent role of kinesiophobia in the transition from acute to chronic low back pain, it may also influence recovery from acute neck pain.<sup>4</sup> However, thus far research has provided no straightforward support for this. Some studies found kinesiophobia indeed to be related to the development of chronic whiplash symptoms or disability.<sup>14,18,19</sup> However, other studies failed to find support for the predictive value of kinesiophobia.<sup>20,21</sup>

One possible explanation for this could be that anxiety-related factors play a more prominent role in whiplash than in low back pain. Different from most cases of low back pain, neck pain typically starts in the aftermath of an often-stressful traffic accident. This could give rise to more intense anxiety symptoms as well as symptoms of post-traumatic stress. In addition, the sudden, traumatic onset might well give rise to stronger somatic beliefs about a physical or somatic origin of their symptoms and elicit fears regarding (non)recovery. Furthermore, it may be that neck pain in itself is experienced as more frightening than low back pain. All in all, the available evidence suggests that fearful preoccupations about non-recovery and a negative course, possibly accompanied with symptoms of post-traumatic stress may be associated with recovery from whiplash, whereas fear of pain *per se* seems not specifically related to the prognosis of post-traumatic neck pain.<sup>22</sup>

Clearly then, the results of research regarding the various components of the FA model seem not entirely consistent. The variability in results may at least partly be due to the large differences in methodological designs, outcome measures, study population, and analyses, or could be associated with the way measures, assessing components of the FA model were designed.<sup>23</sup> More research on critical components or interventions on these components is required to more fully understand the role of pain-catastrophizing and kinesiophobia in post-traumatic neck pain. Meanwhile, research has shown that in post-traumatic neck pain, causal illness beliefs have a specific and independent predictive value regarding the severity and course of neck pain, giving way for an adaptation of the FA model incorporating a more prominent role for illness beliefs.<sup>15</sup>

## ILLNESS BELIEFS

According to the FA model negative appraisals with regard to the origin and/or consequences of an acute pain experience can lead the way to the chronic pain cycle. Appraising pain as a possible sign of serious injury can of course be regarded

as a physiological phenomenon, with evolutionary importance. However, it is in this process of early labeling that possibly the seed for chronicity is planted. Any pain experience can be appraised as “dangerous” or “threatening.” In this regard, the term pain catastrophizing is used to refer to an exaggerated negative interpretation of actual or anticipated pain.<sup>24</sup> Fearful patients will focus more on physical signals, showing hypervigilance, and will find it difficult to shift attention away from the perceived threat. This could interfere with cognitive functioning providing a possible explanation for the perception of impaired cognitive functioning and intensified pain experience.<sup>25–27</sup>

Catastrophizing may give rise to dysfunctional illness beliefs regarding the cause of people’s neck pain, which in turn may elicit negative expectations, thereby contributing to a chronic course.<sup>28</sup> The tendency to attribute neck complaints to irreparable or severe causes may elicit catastrophic interpretations of potentially benign muscular symptoms. Thus, because of their catastrophic interpretation of pain symptoms and dysfunctional causal beliefs, people may enter a downward spiral of increased symptoms, leading to irrational expectations regarding the course of symptoms and disability.<sup>2,3</sup>

It seems useful to investigate what information triggers catastrophic interpretation of people’s symptoms. Straight after the accident, sometimes after hours or even days, patients experience neck pain. This pain is thought to be associated with sprain of the neck muscles. As with any illness, patients develop beliefs regarding the experienced symptoms. This process of forming a mental model regarding the experienced symptoms or illness can be described in various ways. In their model, Petrie and Weinman<sup>29</sup> describe five components: identity of their illness, causal beliefs, timeline beliefs, beliefs about control or cure, and possible consequences. These illness perceptions or cognitive representations are assumed to directly influence behavioral parameters and the emotional response.

Illness beliefs are, among others, shaped by cultural factors. In the large body of research on whiplash, its cultural dependence is often subject of discussion.<sup>28</sup> There seem to be considerable cultural variation regarding whiplash. For example, whiplash only seems to occur in a restricted number of countries and runs an apparently different course in various countries.<sup>30–33</sup> This suggests that the cultural context is a major factor to be considered. Beliefs and expectations regarding whiplash were found to vary profoundly across countries thereby providing a cultural parameter relevant to the prognosis of muscular neck pain.<sup>34–36</sup> The connotation of whiplash may be very different in a population where whiplash is well known and thought to be a very serious condition (*i.e.*, potentially leading to chronic disability), compared to a population where whiplash is hardly known, or associated with a benign course. The illness identity feeds symptom expectation and facilitates the process of attributing symptoms to an illness. That is, when patients receive a certain diagnosis this leads to an increased attribution of significance to potentially relevant symptoms. Moreover, people may interpret particular symptoms as confirmatory evidence for that diagnostic label (confirmation bias) or may even actively

search for threat-confirming information within the cultural context.<sup>37</sup> Beliefs regarding the timeline lead to expectations regarding the course. Expectations regarding the course of post-traumatic neck pain were indeed found to be associated with recovery.<sup>38</sup>

In considering the transition to chronicity, the starting-point of the self-perpetuating pain cycle is of paramount importance. In this regard the *nocebo* response must be mentioned. This counterpart of the placebo response refers to the phenomenon that negative expectations can contribute to a less favorable outcome or even cause symptoms.<sup>39</sup> An example can be found in Mass Psychogenic Illness, where a group of people experience symptoms based on the suggestion of exposure to harmful stimuli (*e.g.*, substances). In a similar vein also the study by Castro *et al.* Investigating the effect of a simulated collision, might be considered as an illustration of the strength of suggestion and the importance of symptom expectation.<sup>40</sup> In most cases of whiplash an initial force will probably cause acute symptoms after which specific beliefs affect the experienced symptoms, thereby potentially influencing the outcome. The *nocebo* response can also explain the negative association found between the early causal belief—conviction that neck pain is caused by whiplash—and the prognosis of the experienced pain. In a prospective cohort study, we found a negative relation between the course of neck symptoms and the early attribution of neck pain to the label whiplash.<sup>15</sup> Following the diagnosis, or the conviction, cultural depended symptom expectations and other illness beliefs may arise, contributing to a less favorable outcome.

All in all, the beliefs regarding the experienced symptoms may play a critical role in the transition to chronicity by shaping the presentation of symptoms and feeding symptom attribution and expectations regarding the course of symptoms.<sup>41,42</sup>

## THE CAUSAL BELIEFS-ANXIETY MODEL

The possible involvement of causal beliefs can be integrated in an adapted FA model, the “causal beliefs-anxiety (CBA) model” (Figure 2).

In this model, causal beliefs play a more important role because they are proposed to be the main factor leading from neck pain to the conviction that the pain is caused by “whiplash.” “Threatening illness information” is already included in the FA model. However, the FA model does not explicitly refer to the critical process that makes the information threatening in the first place. Considering the negative connotations that may be elicited by the term “whiplash,” this aspect seems especially important in post-traumatic neck pain. In the FA model, the pathway from pain to pain-related fear is mediated by catastrophizing. In the causal-beliefs-anxiety model, catastrophizing is proposed to be a moderating factor that may lead to feelings of fear when symptoms are labeled as whiplash.

Accordingly, these beliefs are assumed to function as the gatekeeper, guarding the entrance to the chronic pain circle. This illness belief is moderated by culturally embedded beliefs. Once the belief is established, catastrophizing will



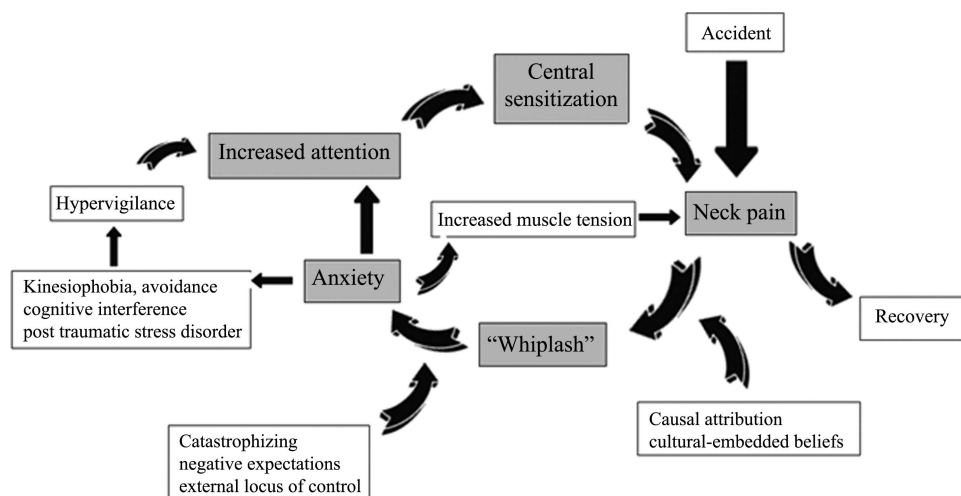


Figure 2. The causal beliefs-anxiety model.

fuel the process, leading to feelings of anxiety regarding the experienced symptoms. Increased anxiety levels have been shown to give rise to increased attention and focus on the perceived symptoms, which is further enhanced by hypervigilance.<sup>25</sup> Increased anxiety levels lead to kinesiophobia and cognitive symptoms due to attention interference, as well as increased muscle tension, which leads to increased or continued neck pain. Moreover, feelings of anxiety and kinesiophobia fuel avoidance behavior, which further aggravates catastrophic interpretations of experienced symptoms, because it prevents disconfirmation of dysfunctional beliefs. Eventually the process of focusing on perceived pain and anxiety results in central sensitization, in which case nociceptive neurons of pain-modulating systems in the central nervous system are thought to become sensitized.<sup>43</sup> Central sensitization may provide a possible explanation for somatic unexplained chronic pain. This topic is covered more extensively elsewhere.<sup>44–46</sup>

## EDUCATING PATIENTS, HEALTH CARE PROFESSIONALS, AND CULTURE

What possible “targets” can be derived from the CBA model for treatment and prevention? To prevent the development of chronic symptoms, the model points to the importance of somehow interrupting the self-perpetuating cycle. Thus, the model implies that each of the critical components of the model may be a proper target for (preventive) interventions. Regarding the FA components of the model, several different types of interventions have been proposed.<sup>47</sup> In the context of this article, we will predominantly focus on interventions that aim to prevent entering the pain cycle in the CBA model.

To modify dysfunctional illness beliefs, there are at least three possible levels for interventions: the individual, the health care professional, and the population.

In clinical practice, however, the patients’ ideas, fears, or expectations regarding their symptoms are usually not extensively investigated, although this seems crucial for getting proper insight into the patient’s illness beliefs. The actual illness beliefs can, of course, be assessed by asking the patient. This could demand for special communication skills. A more formal assessment of a patient’s illness perceptions can be

achieved using the Illness Perception Questionnaire.<sup>48</sup> To more specifically assess causal illness beliefs in post-traumatic neck pain, we recently developed the Causal Beliefs Questionnaire-Whiplash (CBQ-W).<sup>15</sup> Research, using this questionnaire, indicated that attributing early neck complaints to whiplash or psychological factors (as indexed by the CBQ-W) had predictive value over and above the intensity of initial symptoms. This finding not only supports theories regarding the potential influence of culturally embedded causal beliefs, but could also have important implications for management and treatment. Depending on the actual, individual beliefs, recovery could be facilitated by explanation, reassuring or cognitive-behavioral therapy.<sup>49</sup>

Unfortunately, in many cases health care professionals hold varying beliefs regarding the cause and course of whiplash symptoms. Patients seeking for help can easily get confused because of the different explanations, which could in turn elicit or fuel feelings of uncertainty and fear.<sup>50,51</sup> Especially when a patient more generally tends to make negative interpretations (*i.e.*, scoring high on neuroticism), the most negative advice, information, or experience could have the most influential impact. Professional guidelines could provide health care professionals with a uniform framework, facilitating the communication of consistent information to the patient. These professional guidelines should of course also facilitate each patient receiving the most suitable treatment and should get sufficient attention during medical training of health care professionals. Furthermore, health care professionals should be educated on the importance of illness beliefs, especially (but not alone) in medical unexplained conditions, where no physical cause can explain the symptoms. In the early stage adequate explanation or reassurance could alleviate feelings of fear and be sufficient to prevent the transition to chronicity. In later stages, more sophisticated cognitive interventions could be employed, like cognitive-behavioral therapy.

At the population level, interventions in the form of educational campaigns could provide a strategy to educate a population on realistic causes and expectations regarding post-traumatic neck pain.

Although this could lead to a broad and definitive strategy at the population level, it is to be expected that developing such a media campaign will be a slow process taking several years.<sup>52–55</sup>

## CONCLUSION

The FA model provides important theory-derived leads that may help explaining the pathways from acute to chronic pain. Patients experiencing post-traumatic neck pain develop illness beliefs, which influence both behavioral parameters and their emotional response. The causal-beliefs anxiety model is an adaptation of the FA model, emphasizing the critical role of illness beliefs. Interventions aimed at these illness beliefs could contribute to prevention of chronicity. Future research should investigate further the validity of the proposed model. Perhaps most critical, it would be important to test whether interventions designed to modify causal illness beliefs would indeed have a favorable influence on the course of symptoms. If so, this would provide important clues for improving further the available treatment options and might provide potentially fruitful leads for the development of future prevention programs.

## ➤ Key Points

- ❑ The FA model provides important starting points that may help explaining the pathway from acute to chronic pain.
- ❑ To prevent the development of chronic symptoms, it seems important to interrupt the FA cycle. Each of the critical components of the FA model may therefore be a target for preventive interventions.
- ❑ Catastrophizing about the cause of neck pain may give rise to dysfunctional illness beliefs regarding the cause and course of experienced neck pain.
- ❑ Negative outcome expectancies can contribute to a less favorable course or may even cause symptoms. This influence of negative expectations can be conceptualized as a *nocebo* response.
- ❑ To prevent an unfavorable course, it seems critical to prevent dysfunctional illness beliefs. Accordingly, illness beliefs seem an important target for educational campaigns helping to prevent the transition to chronicity.

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